Abstract

Fiber optic gyroscope(FOG) offers significant advantages as an inertial rotation sensor In this thesis we describe the design analysis fabrication and testing of a FOG based on all-fiber approach

In the first chapter of the thesis we review the basic principle of operation the effect of noise sources bias drift scale factor accuracy and related issues connected with FOG Furthermore the open loop and closed loop signal processing schemes and an approach to three axes gyroscope are also reviewed

We have analyzed the effect of various noise sources on the bias drift performance of a FOG The long term bias offset is calculated in terms of noise equivalent rotation rate (NERR) The bias drift performance of the system for single mode (SM) and polarization maintaining (PM) fiber as sensor coil are analyzed The effect of polarization filtering optical source linewidth fiber group delay phase modulator amplitude and frequency fluctuation of a FOG are calculated Other effects which cause bias drift in FOG such as Faraday effect and Kerr effect have also been considered The above analysis forms the content of chapter-2 of the thesis

In chapter 3 we present the design fabrication and testing of a 10 deg/hr class of FOG based on all-fiber approach We have developed a FOG using all-fiber approach and open loop signal processing to realize the basic operation in the laboratory In the second model we improved the scale factor accuracy and reduced the package size by using improved signal processing and SMD components The performance of the two models are presented

Conclusions and suggestions for further work are presented in chapter-4